DYKNAN I.M

US33/Theoretical Physics

B-6

Abs Jour

: Referat Zhur - Fizika, No 5, 1957, No 10930

Author

: Dykman, I.M., Pekar, S.I.

Inst

: Institute of Physics, Academy of Sciences, Ukraine, SSR.

Title

: Nuclomesodynamics in Strong Coupling. III. Translational Motion, Meson-Field Mass, and Magnetic Moment of the

Orig Pub

: Zh. eksperim. i teor. fiziki, 1956, 30, No 6, 1125-1141

Abstract

: The theory is constructed for an extended nucleon with non-relativistic form factor, strongly coupled with the meson field (PS(PV)-variant of meson theory). The fundamental results that can be obtained for a nucleon without allowance for the recoil are contained in the preceding investigations (Referat Zhur Fizika, 1957, 173, 174). This work takes the motion of the nucleon into account

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CIA-RDP86-00513R000411730007-8" APPROVED FOR RELEASE: 08/22/2000

USSR/Theoretical Physics

B-6

Abs Jour

: Referat Zhur - Fizika, No 5, 1957, No 10930

(in the non-relativistic approximation). An approximate method, based on the expansion of the solution in powers of the reciprocal of the nucleon mass, makes it possible to find the magnetic moment of the nucleon in the approximation of the limit of strong coupling. For the proton and neutron the result is the same and the only difference is in the sign. This circumstance indicates that the theory cannot be corrected by taking into account the nucleon motion, and it is necessary to forego the assumption of the limit of strong coupling. The latter complicates the calculation substantially.

Card 2/2

DYKMAN, I M.

AUTHOR: Dykman, I.M.

109-12-8/15

TITLE:

The Problem of the Supply Mechanism of the Activator Vapours to the Outer Surface of a Porous Metal-film Cathode(L-cathode)

(K voprosu o mekhanizme postupleniya parov aktivatora k vneshney poverkhnosti poristogo metallo-plenochnogo katoda)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol. II, No.12, pp. 1525-1529 (USSR)

ABSTRACT: N.D. Morgulis (Ref.1) suggested two mechanisms for the diffusion of barium through the pores of an L-cathode:

1) evaporation of barium from the dispenser into the pores, and 2) migration of barium along the inner surfaces of the pores. The problem is here investigated theoretically. It is assumed that the pores in an L-cathode can be represented as narrow, cylindrical tubes, having a length 1 and a diameter a (such that a < 1), and that the mean free path of the atoms \(\lambda \subseteq 1\). The system under investigation is shown schematically in the figure on p.1526. For the purpose of analysis, it is also assumed that an atom, after its collision with the wall of the tube, is attached to the wall for a time \(\tau\); in general, \(\tau\) is a function of the surface concentration n of the activator. The equilibrium of the \$\mathbf{s}ystem, taken over a surface

Card 1/4

109-12-8/15

The Problem of the Supply Mechanism of the Activator Vapours to the Outer Surface of a Porous Metal-film Cathode (L-cathode)

element  $d\sigma_0$  at a point  $x_0$  of the tube, can be described by:

$$\frac{d\mathbf{n}}{d\mathbf{t}} d\sigma_{\mathbf{0}} d\mathbf{t} = \left[ \mathbf{A} + \mathbf{B} + \frac{d\mathbf{x}}{d\mathbf{x}} \left( \mathbf{D} \frac{\partial \mathbf{n}}{\partial \mathbf{x}} \right) - \frac{\mathbf{n}}{\mathbf{\tau}} \right] d\sigma_{\mathbf{0}} d\mathbf{t}$$
 (1)

where  $Bd\sigma_0 dt$  is the number of atoms impinging on the element  $d\sigma_0$  due to the evaporation from all the remaining elements of the tube surface (see **fig.** on p.1526). The term:

$$\frac{dx}{dx} \left( D \frac{\partial n}{\partial x} \right)$$
,

where D is the surface diffusion coefficient, determines the change in the concentration n and the term:

$$\frac{n}{2}$$
 doodt

denotes the number of the atoms evaporating from the element  $\operatorname{Card} 2/4$ 

The Problem of the Supply Mechanism of the Activator Vapours to the Outer Surface of a Porous Metal-film Cathode (L-cathode)

do during a time interval dt. In the equation, it is also assumed that the vapour pressure of the activator in the regions close to the emitting surface is much lower than the pressure in the dispenser. Solution of the above equation shows that the current through a tube (representing a pore) consists of three components: 1) i, which represents the current through the gas phase; 2) i which is the migration current, and 3) i which is the current due to the atoms proceeding directly from the dispenser. Normally, i can be neglected, in which case i is the Knudsen-type current and the total current can be expressed by:

 $i = \frac{8\pi \beta}{3\tau} a^3 - 2\pi a D\beta \tag{10}$ 

so that the relation between  $i_1$  and  $i_2$  is expressed by : Card 3/4

109-12-8/15
The Problem of the Supply Mechanism of the Activator Vapours to the Outer Surface of a Porous Metal-film Cathode (L-cathode)

$$\frac{i_1}{i_2} = \frac{4}{3} \frac{a^2}{D\tau}$$
 (12).

The process of the activator vapour supply can be more accurately described by assuming that the diameters of the tubes representing the actual pores of the cathode are distributed about an average diameter  $a_0$  according to the probability function expressed by Eq.(13). In this case, the average Knudsen current component  $I_K$  and the migration current component  $I_M$  are expressed by Eqs. (14) and (15) and their ratio is given by Eq.(16). The author expresses his gratitude to Corresponding Member of the Ac.Sc. Ukrainian SSR N.D. Morgulis for suggesting this subject and discussing the results. There are 1 figure and 4 references, 2 of which are Slavic.

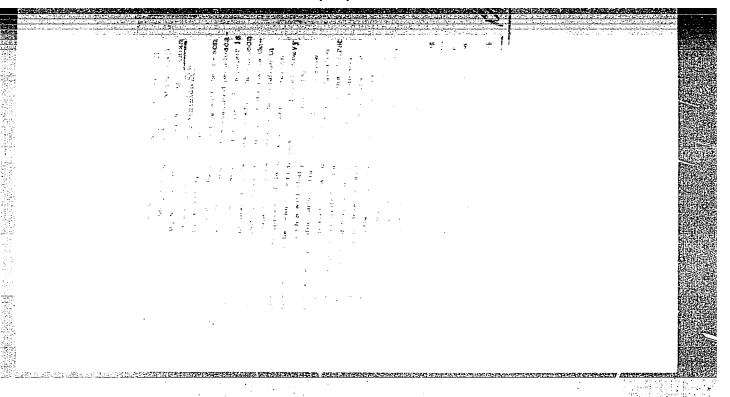
ASSOCIATION: Physics Institute AS Ukrainian SSR, Kiyev

(Institut fiziki AN USSR, g. Kiyev)

SUBMITTED: June 21, 1957

AVAILABLE: Library of Congress

Card 4/4



PA - 2343

On the Theory of Exitons in Ion Crystals

of the electrons or holes respectively, n - refraction index of the crystal, c - constant of the theory of the polarons), exitons of two types may be produced in the crystals: the exitons of the first type do not polarize the crystal in the center and their shifting in the crystal have no connection with the inertia of the ions. Such exitions have a hydrogen-like absorption spectrum consisting of narrow lines, and are called "non-polarizing" exitons. The exiton of the second type - the polarizing exitons - enter essentially into interaction with the ions of the crystal lattice. Polarization exitons result only if the energy level is lower than the corresponding level of the non-polarizing electron.

If the effective radius of the electron and the hole is smaller than the lattice constant, the application of the macroscopic method of computation is no longer justified. In this case polarization of the crystal has to be determined by detailed computations taking account of the microscopic structure of the crystal. This is true especially for exitons in alkali-halide crystals. If polarized exitons are produced in a crystal, the latter may be localized at any point of the crystal. In conclusion the effective mass of the exiton in alkali-halide crystals is evaluated. (No illustrations).

Card 2/3

On the  $T_{\mbox{\scriptsize heory}}$  of Exitons in Ion Crystals.

PA - 2343

ASSOCIATION: Physical Institute of the Academy of Science of the Ukrainian

S.S.R.

PRESENTED BY:

SUBMITTED:

AVAILABLE:

Library of Congress.

Card 3/3

DYKMAN, I.M.

AUTHORS:

Deygen, M. F., Dykman, I. M., Tolpygo, K. B. 57-27-7-40/40

TITLE:

All-Union Conference on the Theory of Semiconductors (Vsesoyuznoye soveshchaniye po teorii poluprovodnikov).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 7,

There are 16 references, 12 of which are Blavic.

pp. 1628-1642 (USSR)

ABSTRACT:

The conference took place in Kiyev on October 9-13, 1956. 40 lectures were held. They comprised the following branches of knowledge: multielectron-theory of the solid body, exiton-processes in semiconductors, interaction between current-carriers and lattice, theory of the polarons, theory of the local states of the electron in semiconductors, zonal structure of the semiconductors, magnetic properties of the semiconductors, phenomenological theory of the semiconductors.

SUBMITTED:

December 30, 1956

AVAILABLE:

Library of Congress

1. Conferences-Theory of semiconductors-Kiyev 2. Semiconductors-Theory

Card 1/1

DYKMUN, I.M.

AUTHOR: TITLE:

Dykman, I.M. 57-8-1*3/3*6

The "Spuren" Method in the Problem of Exiton (Metod shpurov

v zadache eksitona)

PERIODICAL:

Zhurnal Tekhn.Fiz. 1957, Vol 27, Nr 8, pp 1731-1743 (USSR)

ABSTRACT:

Exitons in ion-crystals are investigated by means of the "Spuren" method. The interaction between electron and hole on the one hand and lattice oscillations on the other are regarded. The energy of the basic and that of the first excited level of the system are determined with an exactness of up to the members of the second least power. The dependence of the energy of the basic state on the temperature is shown. The author shows that the change of energy at low temperatures is determined first of all by the decrease of the interaction of charged particles with the field of polarized oscillations in the case of a rise of temperature and not by the increase of kinetic energy. In order to express the progressive motion of the exiton its effective mass is calculated. There are 14 Slavic references.

Institute for Physics of the Academy of Sciences of the Ukrainian SSR (Institut fiziki AN USSR)

SUBMITTED: February 25, 1957

AVAILABLE: Library of Congress

Card 1/1

ASSCCIATION:

AUTHORS:

Glazman, Yu. M., Dykman, I. M., Strel'tsova, Ye. A., 20-117-5-29/54

TITLE:

The Antagonism of Ions in the Coagulation of Lyophobe Sols by Electrolytes (Ob antagonizme ionov pri koagulyatsii liofobnykh zoley elektrolitami).

PERIODICAL:

Doklady AN SSSR, 1957, Vol. 117, Nr 5, pp. 829-832 (USSR)

ABSTRACT:

In a preliminary paper of the authors (reference 1) it was shown, that on the coagolation of lyophobe sols by a mixture of two symmetric electrolytes of the type 1 - 1 + 2 - 2 the synergism. effect must be taken into consideration almost in the whole range of their concentrations. At the same time the supposition was pronounced, that in the case of a differing composition of the electrolytes the computations may furnish quite different results. The present investigation is destined to examine the correctness of this assumption. The authors conducted computations analoguous to the ones mentioned in the preliminary paper, especially for the case of the congulation of a sol by a mixture of electrolytes of the type  $1_2$  - 2 + 2 - 2. At first a differential equation for the electrolytic potential in an arbitrary point of the solution is given. This potential Y is then, for the sake of convenience, replaced by a dimensionless potential. Besides, the sol is here supposed to be strongly charged. The whole range of the possible concentrations  $\mathbf{n}_1$  and  $\mathbf{n}_2$  is of identical interest for the problem

Card 1/2

The Antagonism of Ions in the Coagulation of Lyophobe Sols by 20-117-5 -29/54 Electrolytes.

investigated here. The parameter n<sub>1</sub> is here considered to be infinitely small, and it is sufficient to break off the series expansion with respect to n<sub>1</sub> after the first term. Then formulae corresponding to this approximation are written down. The course of the computation is followed step by step and shows the subsequent results; The rules of the coagulation of lyophobe sols by mixture of electrolytes of the type 1 - 1 +2 -2 and 12 -2 +2 - 2 are opposed to each other in a qualitative sense. In the first case the synergism is substantiated theoretically and in the second case the theory leads to a sharply pronounced antagonism. In the coagulation of lyophobe colloides there must be distinguished two types of antagonisms: 1) An antagonism connected with the competition for the adsorption places on the surface of the colloidal part\_cles. 2) An antagonism caused by the electrostatic interaction of the ions in the volume of the solution and in the electric field of the colloidal particles. There are 3 references, 2 of which are Slavic.

PRESENTED:

June1o, 1957, by P. A. Rebinder, Academician

SUBMITTED:

June 7, 1957

Card 2/2

SOV/109-3-8-2/18

Dykman, I.M. and Kaplunova, Ye.I. AUTHORS:

The Role of Colloidal Particles in the Electric TITLE:

Conductivity and Thermal Emissivity of Semi-conductor Cathodes (O roli kolloidnykh chastits v elektroprovod-

nosti i termoemissii poluprovodnikovykh katodov)

Radiotekhnika i Elektronika, 1958, Vol 3, Nr 8, PERIODICAL:

pp 990 - 999 (USSR)

In 1954, Ortusi (Ref 7) put forward the hypothesis that ABSTRACT: colloidal particles of metallic barium can exist in an oxide cathode after its activation. These particles

are formed in barium oxide in the vicinity of certain negatively-charged centres which attract oxygen

vacancies. The presence of colloidal particles affects

the characteristics of electron conductivity and thermionic emission of the cathode and it is therefore of interest to investigate the electrical properties of a semi-conductor which has an excess of metallic atoms which can be either in the atomic or colloidal phase.

It is assumed that a semi-conductor cathode contains Recess metal atoms in a unit volume and that R

A Section Control is independent of temperature.

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SOV/109-3-8-2/18
The Role of Colloidal Particles in the Electric Conductivity and Thermal Emissivity of Semi-conductor Cathodes

At a given temperature the number of atoms in the atomic phase is  $\mu_1$  and in the colloidal is  $\mu_2$ . In a thermo-dynamic equilibrium, the chemical potentials of both the phases  $\mu_1$  and  $\mu_2$  should be equal. It is necessary to determine the magnitude of  $\mu_1$  or  $\mu_2$ . The metallic atoms contained in the interstices of the crystalline lattice can be regarded as a system of harmonic oscillators, whose energy is expressed by Eq.(1), where  $\mu_0$  is a constant corresponding to the minimum energy,  $\mu_0$  is the frequency of oscillation of an atom and  $\mu_0$  is the mass of an atom. The free energy of the atoms is given by Eq.(2), where  $\mu_0$  is the concentration of the interstices and  $\mu_1$  is given by Eq.(3). The chemical potential  $\mu_1$  is given by:

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SOV/109-3-8-2/18

The Role of Colloidal Particles in the Electric Conductivity and Thermal Emissivity of Semi-conductor Cathodes

$$\mu_{1} = \frac{\partial Y_{1}}{\partial R_{1}} = kT \ln \left[ e^{-H_{0}kT} \left( \frac{kT}{\hbar\omega} \right)^{3} \frac{N_{M} - R_{1}}{R_{1}} \right]$$
 (4)

For finding  $\mu_2$ , a colloidal particle is regarded as a part of the crystal lattice of the metal. The free energy of the particle can be described by Eq.(5). If it is assumed that the number of oscillation branches is three, Eq.(5) can be written as Eq.(7), from which it follows that  $\mu_2$  is given by Eq.(8). By comparing  $\mu_1$  and  $\mu_2$ , the equilibrium concentration of the atomic metal is expressed by:

$$R_{1} = \frac{N_{M}}{1 + \gamma e^{\delta/kT}}$$
 (9),

Card3/7 where  $\delta$  and  $\gamma$  are given by Eqs.(10). For the case of

507/109-3-8-2/18

The Role of Colloidal Particles in the Electric Conductivity and Thermal Emissivity of Semi-conductor Cathodes

anionic vacancies in the cathode, the free energy is expressed by Eq.(11), where p is the number of colloidal particles in the interstices of the lattice and the free energy of an ideal lattice which can be expressed by Eq.(12). If each colloidal particle loses s atoms by evaporation, its free energy is expressed by Eq. (14). On the other hand, the free energy of a lattice with sp anionic vacancies is expressed by Eq.(15). The full, free energy of the system is given by Eq.(17). From the condition of minimum, free energy, it follows that the number of vacancies sp is expressed by Eq.(18), where  $\gamma_1$  is defined by Eq.(19). Comparison of Eqs.(9) and (13) shows that both the types of the barium distribution in the cathode lead to the same distribution law for the atomic particles. If the cathode contains both the atomic and colloidal phases simultaneously, each of these can act as an electron donor. In the state of equilibrium, the system can be characterised by a common chemical potential  $\mu$  . This can be found from the condition of the neutrality

μ. This can be found from the condition of Cord4/7 of the system, which is expressed by:

SOV/109-3-8-2/18
The Role of Colloidal Particles in the Electric Conductivity and Thermal Emissivity of Semi-conductor Cathodes

$$n_{-} = Q_{-}e^{\mu | kT} = \frac{R_{1} v e^{kT}}{\frac{\varepsilon - \mu}{kT}} + \frac{q}{e_{0}}$$
 (20)

where Q\_ is the number of states in a zone, e\_ is an elementary charge,  $\gamma$  is a multiplier functionally related to the valency of the donors and q is a positive charge on a colloidal particle. The charge q can be expressed by Eq.(21), where r is the radius of a colloidal particle and  $\mu_0$  is the Fermi level of a non-charged particle. From Eqs.(20) and (21), the final expression for  $\mu$  is in the form of Eq.(22). The formula was used to carry out some numerical calculations and to plot a number of graphs. The values of  $\mu$  for various  $\delta$ ,  $\varepsilon$  and  $\mu_0$  are shown in the table on p 995, while the

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curves illustrating temperature dependence of  $\mu$  are given in Figure 1 (Curves  $\alpha,$  a,  $\beta$  and b). The above theoretical results can be extended to include the case of the semi-conductors containing an admixture of "foreign" colloidal particles. It is shown that, in this case, the concentration  $R_1$  is expressed by Eq.(26).

All the above calculations were carried out for the temperatures and the concentrations at which the number of the colloidal particles was comparatively large and it was therefore possible to assume a uniform potential inside the cathode. In cases where the number of colloidal particles is small, the distribution of the potential inside the cathode, for a given colloidal particle, is variable and can be found by solving a Debye-type equation. If a colloidal particle is in the vicinity of the surface, the variation of the potential along the surface corresponds to the change of the work functions. On the other hand, a donor-type particle leads to the appearance of regions having a reduced work function. An acceptor-type particle at the surface leads to the appearance of regions

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SOV/109-3-8-2/18
The Role of Colloidal Particles in the Electric Conductivity and Thermal Emissivity of Semi-conductor Cathodes

with an increased work function. From this, it is possible to conclude that the presence of colloidal particles may be one of the causes of the spot-like structure of the actual oxide cathodes. The authors express their appreciation to Corresponding Member of the Ac.Sc. Ukrainian SSR, N.D. Morgulis, for his interest in this work and for useful discussions. The authors also thank their senior collaborator K.B. Tolpygo, for a number of valuable remarks. There are 2 figures, 1 table and 8 references, 7 of which are English and 1 French.

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics,

Ac.Sc. Ukrainian SSR, Kiyev)

SUBMITTED: January 29, 1958

Card7/7 1. Semiconductors--Electrical properties 2. Semiconductors--Electrical properties 2.

tro transitions 3. Semiconductors--Mathematical analysis

4. Oxide films -- Electrical effects

69-58-2 -4/23

AUTHORS:

Glazman, Yu.M.; Dykman, I.M.; Strel'tsova, Ye.A.

TITLE:

The Coagulation of Lyophobic Sols by the Action of Electrolyte Mixtures. Communication 2. (O koagulyatsii liofobnykh zoley pri deystvii smesey elektrolitov. Soobshcheniye 2)

PERIODICAL:

Kolloidnyy zhurnal, 1958, Vol XX, Nr 2, pp 149-158 (USSR)

ABSTRACT:

During coagulation of lyophobic sols, caused by the mixture of two symmetrical electrolytes of the 1-1+2-2 type, a synergetic effect takes place within their concentration range. The action of these two electrolytes is accompanied by two contradicting factors. Synergism is caused by the addition of the electrolyte and is connected with the compression of a diffused ion atmosphere. A tendency toward antagonism is caused by the screening of the antiions of the electrical field. Electrolytes of the 12-2+2-2 type have also been considered. The principal difference of the two types consists in the fact that the side ion of the first of the two electrolytes is bivalent. The theoretical calculation indicates antagonism, whereas in the 1-1+2-2 type it indicates synergism. There are two types of antagonism during the coagulation of lyophobic colloids: 1) the antagonism between

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69-58-2 -4/23

The Coagulation of Lyophobic Sols by the Action of Electrolyte Mixtures. Communication 2

coagulating ions associated with competition for the sites of adsorption on the surface of the colloid particles: 2) the antagonism due to the mutual electrostatic interaction of the ions in the bulk of the polution and in the electrical field of the colloid particles.

There are 8 references, 6 of which are Soviet, 1 French and 1 German.

T Germa.

Kiyevskiy tekhnologicheskiy institut legkoy promyshlennosti (Kiyev Technological Institute of Light Industry)

SUBMITTED: February 23, 1957

1. Chemical compounds—Coagulation 2. Electrolytic compounds—Applications

Card 2/2

ASSOCIATION:

AUTHORS: Dykman, I. M. Zaslavskaya, I. G. sov/57-23-9-15/33

TITLE:

Excitons in Ionic Crystals With Intermediate Binding (Eksitony

v ionnykh kristallakh pri promezhutochnoy svyazi)

PERIODICAL:

Zhurnal tekhnicheskoy fiziki, 1958/Nr 9, pp. 1959 - 1965 (USSR)

ABSTRACT:

Quite recently a method for the investigation of a system of electric charges in ionic crystals with intermediate binding was suggested by Buymistrov and Pekar in reference 6. Among the methods found in publications of the investigation of intermediate bindings this method proved to be the best when applied to polarons. In this paper the method is applied to excitons. The energy level of the system is reduced at all values of the crystal parameters as compared to the hydrogen-like level of the exciton. The energy decreases lineraly with n2c due to the interaction with the lattice. From certain levels this dependence can be more

pronounced. n denotes the refraction index, and

 $c = \frac{1}{n^2} - \frac{1}{\epsilon}$ , where  $\epsilon$  denotes the dielectric constant. The

Card 1/2

two types of excitons resulting from the work reported in

Excitons in Ionic Crystals With Intermediate Binding SOV/57-33-9-15/33

reference 2, prove to be physically justified from the viewpoint of a more general method, as limiting cases with closely and loosely bound excitons. There are 1 figure and 7 references, 5 of which are Soviet.

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics AS UkrSSR, Kiyev)

Card 2/2

AUTHORS:

Dykman, I. M., Tsertsvedze, A. A.

504/56-34-5-39/61

TITLE:

Exiton Energie in Alkalı-Halogen-Crystals (Energiya eksitona

shchelochno - galoidnykh kristallakh)

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1958,

Vol. 34, Nr 5, pp. 1319 - 1321 (USSR)

ABSTRACT:

I.M. Dykman (Ref 1) developed a model of the exiton in alkalihalogen-crystals. Even if the exiton functions are unknown this model permits to compute the change in polarisation energy of the lattice, the half width of the band of the exiton absorption and its temperature dependence, the field mass of the exiten. and of some other quantities. These quantities essentially are characterized by the excited and not by the ground state of the crystal. For the computation of the energy of the exiton transition and of its probability, of the cross sections of the transition of the exitons with various centers of admixture etc., however, one must start from the eigenfunctions of the system

in the excited and in the ground state. The introduction of the

Card 1/3

wave functions to and texcited of the ground state and of the

Exiton Energie in Alkali-Halogen-Crystals

807/56-34-5-39/61

excited state respectively into the Hamiltonian of the system (which describes all sorts of electrical pair interactions between the electrons and the nuclei of the crystal) permits the computation of the energies  $E_0$  resp.  $E_0$  excited of the ground and of the excited state, respectively. Their difference determines a form given explicitly and explained. This expression was computed numerically for an NaCl crystal. After consideration of the inertialess polarisation of the electron shells of the ions in NaCl is obtained. This value satisfyingly agrees with the experimental value of  $\triangle$   $E(\sim 7.85 \text{ eV})$ . With consideration of the translatory symmetry of the problem the wave function can be

$$\frac{1}{K} = N^{-1/2} \underbrace{\exp(ik r^2)}_{\text{excited}},$$

Card 2/3

For the width of the exiton zone a formula is given as well. This which are Soviet.

Exiton Energie in Alkali-Halogen-Crystals

S0Y/56-34-5-39/61

ASSOCIATION: Thilisokiy gosudarstvennyy universitet (Thilisi State University)

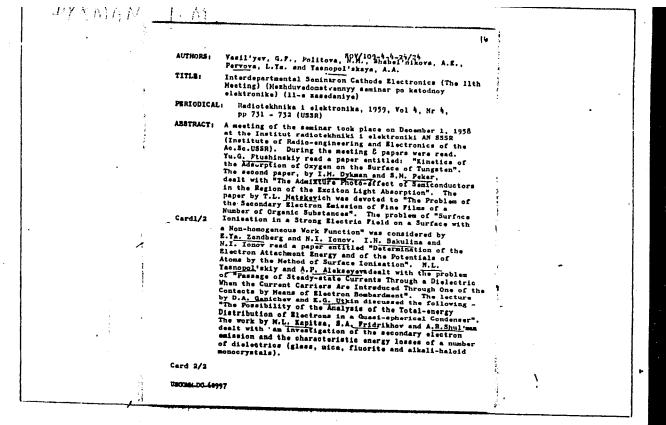
SUBMITTED:

October 29, 1957

1. Electron transitions--Analysis 2. Electron transitions--Energy 3. Alkale halogen crystals models--Applications 4. Perturbation theory--Mathematical analysis 5. Alkali halogen crystals--Excitation 6. Mathematics -- Applications

Card 3/3

Madealyn nnuk Ukrainakoj 2:8. Inaithai Eiiki Sovjiho Madealyn nnuk Ukrainakoj 2:8. Inaithai Eiiki Poboalakiriohaskiya i apitan skiya yavieniya v poluprovodnikakij i rinda parvoga vacenojuznoka usvanjenizala, a forca-i-kriidheskia i optidasija svileniyan vrpi poluprovodnikaki, k kryev, 200- nosabiza svileniyan vrpi ondovinaka, k kryev, 200- and optidasi pranamationa of ma Pirat Conference on Fibocekastria and optidasi pranamationa of ma Pirat Conference on Fibocekastria and optidasi pranamationa of ma Pirat Conference on Fibocekastria and optidasi pranamationa of ma Pirat Conference on Fibocekastria and optidasi pranamationa of ma Pirat Conference on Fibocekastria E. of Publishing Bouser I. V. Kiaina; Tech. Ed.: A. A. Matvepthuk; Resp. Ed.: V. Ko. Lashkarov, Academician, Ukrainian 338, Academy of Saismoss.  FIRPOSE: This book is intended for saidmitas in the field of semi- conductors physics, collidate a epectroacopy, and centenders in universities and intelluture of higher recentes training specializing in the physics and tedmical craining specializing in the physics and tedmical application of semi- conductors.  COVEAGE: The andlection contains roports and information of semi- conductors.  COVEAGE: The analestion contains roports and information by and accompletely physics and teomology are considered in photoslectria cells and conductors. A wide-scope of problems in semiconductors physics and teomology are considered in photoslectria cells and and semiconductors and teomology of conference of thin films and complex semistantes of thin films and complex secusionical systems, the properisor of thin films and complex secusionical systems,		Moskalenko. 2, A. Mott's Theory of Excitons in Ionic Crystals 121 Moskalenko. 2, A. Mott's Theory of Excitons in Ionic Crystals 121 Orthonko. 2, A. and E. I. Rashba. The Diffusion of Excitone 123 The Montomogeneous Pield 3, Ostmanium The Kinetics of Some Electron Processes in Semiconductors 132 Card 6/15	
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24(2), 24(4)

Dykman, I. M., Pekar, S. I.

507/56-37-2-27/56

TITLE:

AUTHORS:

Light Waves in Crystals in the Range of Exciton Absorption

and the Impurity Photoeffect

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1959,

Vol 37, Nr 2(8), pp 510-521 (USSR)

ABSTRACT:

The aim of this paper is to estimate the amplitude of all five wave types generated in a crystal in comparison to the amplitude of the incident wave. The relations thus found are then used for the determination of the intensity and the frequency dependence of the impurity photoeffect, which in the range of exciton absorption have several singularities. In the first part the amplitudes of the electric field strength of the waves are calculated which occur in a cubical crystal illuminate.

waves are calculated which occur in a cubical crystal illuminated by monochromatic light. These calculations may be simplified for the two following limiting cases: A) The absolute values of the refractive indices  $n_{\perp}$  and  $n_{\perp}$  of the transverse

waves are considerably in excess of unity. The general formulas found in a previous paper by S. I. Pekar can in this case be simplified considerably, and they are also given explicitly.

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SOV/56-37-2-27/56 Light Waves in Crystals in the Range of Exciton Absorption and the Impurity Photoeffect

An estimate is also made of the relative magnitude of the waves generated in the crystal. The amplitudes of the two transverse waves are considerably smaller than the amplitude of the incident wave. The amplitudes of the longitudinal wave is of the same order as the incident wave if the incident angle  $\varphi$  is not too small. It appears that the longitudinal wave is very intensive, dominating the transverse wave. B) In this case  $\omega \sim \omega_0^{\prime}$  holds, the refractive index of the normal trans-

verse wave being much smaller than unity. The amplitude of one of the transverse waves becomes negligibly small, and all properties of the (normal) transverse wave approximate those following from the conventional electromagnetic optics of crystals. The relative magnitude of the amplitudes of the waves occurring in the crystal are estimated. If  $\mid n \mid \sim \sin \varphi$  holds, the amplitude of the longitudinal wave is of the same order as that of the transverse wave investigated above. This means that it may be several hundred times that of the incident wave. If  $\mid n \mid < \sin \varphi$  the amplitude of the longitudinal wave is in excess of that of the normal transverse wave. In a diagram the frequency dependence  $\mid E_{\parallel}/A_{\parallel}\mid$  is shown. These approximations

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307/56-37-2-27/56

Light Waves in Crystals in the Range of Exciton Absorption and the Impurity Photoeffect

are true only for an absorption sufficiently weak so as to justify a neglect of the imaginary part of  $n^2$ . In the integrals used herein, however, even a small imaginary part of n2 is essential. In case A, where the amplitudes of the four transverse waves are of the same order, the results found in this study differ from ordinary crystal optics. In case B the normal transverse wave has almost the same properties as in ordinary crystal optics. The energy flux entering the crystal, which differs from zero, and which is connected with the energy expended in photoionization, may be determined in the following approximation, if the weak absorption in the crystal is taken into account. In the following part the case of the refractive index being equal for two waves with identical polarization is discussed. The two pertinent linear independent solutions are written down. Both solutions represent waves with a zero group velocity. In the third section the frequency dependence of the impurity photoeffect in the range of exciton absorption is discussed. The authors express their gratitude to I. G. Zaslavskaya for carrying out the numerical

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507/56-37-2-27/56

Light Waves in Crystals in the Range of Exciton Absorption and the Impurity Photoeffect

calculations. There are 6 figures and 11 references, 8 of

which are Soviet.

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR

(Institute of Physics of the Academy of Sciences of the

Ukrainskaya SSR)

SUBMITTED: March 10, 1959

Card 4/4

9.4300 (1035,1138,1143) 26.1632 8/181/60/002/009/028/036 B004/B056

AUTHORS:

Dykman, I. M., Tomchuk, P. M.

TITLE:

The Effect of the Electric Field Upon Electron Temperature, Electrical Conductivity, and the Thermionic Emission of Semiconductors. I. Atomic Semiconductors. Development of the Method

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2228-2239

TEXT: An investigation is carried out of an atomic, unbounded, homogeneous semiconductor with constant electron concentration n in the conductance band, with quadratic dispersion law  $\xi=p^2/m$  ( $\xi=energy$ , p=pulse, m=mass of the electron). A field F is applied to the semiconductor in the direction of the z-axis. The distribution function

 $\begin{cases} f(\vec{p})d\vec{p} = n \text{ (1) in the steady state is obtained from the kinetic equation:} \\ gf/\partial t = (\partial f/\partial t)_F + (\partial f/\partial t)_F + (\partial f/\partial t)_F + (\partial f/\partial t)_F + (\partial f/\partial t)_F = 0 \text{ (2), which expresses} \\ \text{the change in } f(\vec{p}) \text{ under the action of the field F, the lattice vibration} \\ \mathcal{L}, \text{ the electron interactions e, and the scattering } \mathcal{P} \text{ by impurity ions.}$ 

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The Effect of the Electric Field Upon Electron
Temperature, Electrical Conductivity, and the
Thermionic Emission of Semiconductors. I. Atomic
Semiconductors. Development of the Method

Equation (2) is solved by expansion in Legendre polynomials:  $f(\vec{p}) = f_0(p) + \cos \mathcal{V}_{1}(p)$ ;  $(\cos \mathcal{V} = p_2/p)$  (3). For the individual terms of (2), the expressions (4), (5), (7), (12) are written down, substituted into (2), and thereby the system of equations:  $(8\pi Bm/p^2)L [f_0(p), f_0(p)] + \{(s^2/lkT_0)(g^4/p^2)[f_0 + (mkT_0/p)(df_0/dp]\} + (1/3)e_0Ff_1 = 0$  (16) and  $8\pi BmM [f_0(p), f_1(p)] - 2Bmn(f_1/p^3) - (g^4/lmp^3) \cdot f_1 + e_0F(\partial f_0/\partial p) = 0$  (17) is obtained. B, L, M are defined by equations (8) and (11). By substituting the variables  $x = p\sqrt{\alpha}$ ,  $\begin{cases} o(x) = (1/D)f_0(p), \\ o(x) = (1/D)f_0(p), \\ f_1(x) = (1/D)f_1(p) \end{cases}$  (19) as well as  $\alpha = (2mkT)^{-1}$ ,  $\alpha = n = n$  ( $\alpha/\pi$ )  $\alpha = n$  (20), the equation  $\alpha = n$  (1) is obtained. Neglect of the terms with  $\alpha = n$  in (21) leads to the Maxwell function  $\alpha = n$  (23). The parameter T expresses the electron temperature. Card 2/4

The Effect of the Electric Field Upon Electron S/181/60/002/009/028/036
Temperature, Electrical Conductivity, and the B004/B056
Thermionic Emission of Semiconductors. I. Atomic Semiconductors. Development of the Method

Substitution of (23) in (17) and introduction of the coordinates (19) lead to equation (25), integration to equation (27), and, at  $x \rightarrow \infty$ , to equation (29), after which finally  $\int_{0}^{1} (x) = Cx \exp(-x^{2}) + x \exp(-x^{2}) \cdot \int_{0}^{1} [y(x)/x] \exp(x^{2}) dx$  (31) is found. As a final result, the following is given for the electron temperature:  $T = (T_{0}/2) \int_{0}^{1} (1 + (3\pi/32))(e_{0})^{2} \int_{0}^{1} (43)$ ; and for the conduction current:  $f = (3\pi/16)e_{0}^{2} \int_{0}^{1} \sqrt{2\pi/mkT}$  (44). The authors enumerate the conditions under which, according to their opinion, their method may be used also to determine the distribution function of electrons in a plasma. They mention B. I. Davydov and I. M. Shmushkevich (Ref. 1), S. I. Levitin (Ref. 4), V. L. Ginzburg and V. P. Shabanskiy (Ref. 5), and L. D. Landau (Ref. 12). There are 15 references: 7 Soviet, 4 US, 3 British, 2 Japanese, and 1 German.

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84,087

The Effect of the Electric Field Upon Electron S/181/60/002/009/028/036 Temperature, Electrical Conductivity, and the B004/B056
Thermionic Emission of Semiconductors. I Atomic Semiconductors. Development of the Method

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics of

the AS UkrSSR, Kiyev)

SUBMITTED: January 5, 1960

Card 4/4

20147

9.4300 (and 1138)

S/181/61/003/002/045/050 B102/B201

AUTHORS:

Dykman, I. M. and Tomchuk, P. M.

TITLE:

Effect of an electric field upon the electron temperature, the electrical conductivity, and the thermionic emission of semiconductors. III. Thermionic emission

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 632-641

TEXT: The present work is based upon the results given in chapter I of Ref. 1: FTT, Vol. 2, 2228, 1960, formulas and definitions being also taken in part from the said paper. It had already been shown there that in semiconductors displaying sufficiently high concentrations of the conduction electrons, the spherical-symmetrical part of the electron-distribution function, also if there is a relatively strong electric field, is a Maxwellian. The authors of the present paper were concerned with determining this spherical-symmetrical part of the distribution function of fast conduction electrons, and with examining the conditions under which the electron gas is heated by the electric field; criteria are formulated in this connection. The spherical-symmetrical part  $\hat{f}_0(x)$  of the electron Card 1/6

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S/181/61/003/002/045/050 B102/B201

distribution function is determined by proceeding from an equation obtained in I, in addition taking account of the interaction between electrons and optical phonons. This equation is then given with

 $\psi(x)\left[\frac{d\xi_0}{dx}+2x\xi_0(x)\right]+\beta_1\left[\frac{T_0}{T}\frac{d\xi_0}{dx}+2x\xi_0(x)\right]g_1^4(x)+$ 

 $+\beta_0 \left[ \frac{\theta_0}{T} \left( N_0 + \frac{1}{2} \right) \frac{d\xi_0}{dx} + 2x \xi_0(x) \right] g_1^2(x) + 2\beta_2 x^3 \xi_1(x) = 0.$ 

its solution reads is derived:

 $\int_{0}^{\infty} (x) = \text{const.e}^{-\frac{T}{T}(x)} \quad (10) \text{ and the following equation}$   $\mathcal{F}(x) = 2 \int \frac{\left[\psi(x) + \beta_{1}g_{1}^{4}(x) + \beta_{0}g_{1}^{2}(x)\right]xdx}{\psi(x) + \frac{T_{0}}{T}\beta_{1}g_{1}^{4}(x) + \frac{\theta_{0}}{T}\left(N_{0} + \frac{1}{2}\right)\beta_{0}g_{1}^{2}(x) + \beta_{F}\frac{x^{6}}{g_{1}^{4}(x)}}.$ 

 $\frac{x^3}{x^4(x)}$   $\frac{d\xi_o}{dx}$ , where  $1/\alpha^2 = 1/1 + 1/1_o$ . The heating of the

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electron gas by the field F is described by

$$\frac{T}{T_0} = \frac{1}{2} \left[ 1 - \frac{k\theta_0 l}{4ms^2 l_0 (2N_0 + 1)} \right] + \frac{1}{2} \left\{ \left[ 1 + \frac{k\theta_0 l}{4ms^2 l_0 (2N_0 + 1)} \right]^2 + 4 \left[ \frac{\theta_0}{2T_0} \operatorname{cth} \left( \frac{\theta_0}{2T_0} \right) - 1 \right] \frac{k\theta_0 l}{4ms^2 l_0 (2N_0 + 1)} + \frac{(e_0 F)^2 l \mathcal{L}}{3ms^2 k T_0} \right\}^{1/s}.$$
(14)

If  $\theta_0 \ll T_0$  ( $\theta_0$  being the "temperature" of the optical phonon, determined from the relation  $\hbar\omega_0=k\theta_0$ , and  $T_0$  the temperature of the crystal lattice) will be simplified to

$$\frac{T}{T_0} = \frac{1}{2} \left[ 1 - \frac{(k\theta_0)^2 l}{8ms^2 k T_0 l_0} \right] + \frac{1}{2} \left[ \left( 1 + \frac{(k\theta_0)^2 l}{8ms^2 k T_0 l_0} \right)^2 + \frac{(\epsilon_0 F)^2 l \mathcal{L}}{3ms^2 k T_0} \right]^{1/s}.$$
 (15)

As may be seen, the temperature of the electron gas first increases quadratically with growing F, and linearly afterwards. The inequality

$$\frac{T}{T_0} \leqslant \frac{1}{2} \left[ 1 + \sqrt{1 + \frac{(I_0 F)^2 I \mathscr{L}}{3ms^2 k T_0}} \right]. \tag{16}$$

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is practically always satisfied (m,s, and l are the parameters of the semiconductor). The thermionic current

I =  $e_0$ nD\*  $\sqrt{kT/2\pi m}$   $\int_0^x uexp(-\mathcal{F}(u+v))du$  is then calculated, where D denotes the mean penetrability of the potential barrier semiconductor - vacuum,  $u=x^2$ , v=y/kT, y is the external work function of the semiconductor. Two limit cases are considered in this connection: 1) the impact-ionization mechanism does not have any effect upon the value of I; 2) the impact-ionization mechanism is considerable. In the former case  $(x_0^2/4=\epsilon_0>u_1)$  the fast-electron distribution function is found to be approximately Maxwellian, with an electron temperature equalling the lattice temperature

 $I \simeq \frac{e_0 n D^{\circ} T_0^2}{T^2} \left( \frac{kT}{2\pi m} \right)^{1/s} C_1(v) e^{-\frac{\varphi}{kT_s}}. \tag{29}$ 

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Furthermore,  $I/I_0 = (T_0/T)^{3/2} c_1(v)$ , where  $I_0$  is the equilibrium thermionic current.  $I(T_0)$  and the energy distribution of the thermionic electrons almost equals the corresponding characteristics in equilibrium thermionic emission. In the second case  $(x_0^2/4 = \xi_0 < v)$ , the formula

$$I \simeq \frac{\epsilon_0 n D^{\bullet}}{\mu_1^2} \left(\frac{kT}{2\pi m}\right)^{1/2} C_1(\epsilon_0) e^{-\epsilon_0 \left(\frac{T}{T_a} - \mu_1\right)} \left[1 + \frac{\mu_1 \mu_2^3}{4} (v^4 - \epsilon_0^4)\right] e^{-\frac{\mu_1 \nabla}{kT}}.$$
 (37)

obtained for I deviates from the Maxwellian shape considerably. Under certain conditions, above all if the electron temperature is higher than  $T_0$  but lower than T (the electron gas temperature)  $\xi(I)$  can be approached to the Maxwellian shape. With otherwise unvaried parameters, I is always larger for  $\xi_0 < v$  than for  $\xi_0 > v$ . There are 5 references: 3 Sovietbloc and 2 non-Soviet-bloc.

Card 5/6

2011,7

Effect of an electric field ...

S/181/61/003/002/045/050 B102/B201

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics

AS UkrSSR, Kiyev)

SUBMITTED:

July 6, 1960

Card 6/6

25679

S/181/61/003/007/001/023 B102/B202

5.4,7700 (1138,1043,1158,1160)

AUTHORS:

Dykman, I. M. and Tomchuk, P. M.

TITLE:

Effect of an electric field on electron temperature, electrical conductivity, and thermionic emission of semi-conductors. IV. Low lattice temperatures

PERIODICAL: Fizika tverdogo tela, v. 3, no. 7, 1961, 1909 - 1919

TEXT: The present paper was the subject of a lecture delivered on October 19, 1960 at the Fourth Conference on Semiconductor Theory, Tbilisi. This paper is the fourth in a series; the references to the previous papers read as follows: Ref. 1: FTT, II, 2228, 1960; Ref. 2: FTT, III, 3, 632, 1961; Ref. 3: FTT, III, 4, 1258, 1961. The authors generalize a method which has been developed in Ref. 1 so that it can be applied also to low temperatures where the scattering from impurities can no longer be neglected, and may even exceed the scattering from the lattice. The distribution function  $f(x) = f(x) + f(x) \cos f$  of the conduction electrons in atomic semiconductors located in a homogeneous electric Card 1/6

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field F, was determined in Ref. 1 (x is the dimensionless electron momentum,  $x = p/(2mkT)^{1/2}$ ). Neglecting the impurity scattering, the current j and the electron temperature T were calculated. At low temperatures or high field strengths, however, no agreement could be obtained between these results and the experimental ones. This is ascribed to the fact that neither impurity scattering nor electron heating by the field have been taken into account. The authors proceed from the kinetic equation  $(\partial \xi/\partial t)_F + (\partial \xi/\partial t)_L + (\partial \xi/\partial t)_e + (\partial \xi/\partial t)_p - 0$  (consideration of the effect of field, lattice, electron collisions, and impurity scattering). It is assumed, however, that  $T_0 \ll \theta_0$  ( $\theta_0$  Debye temperature) where  $k\theta_0 = \hbar c_0$ , is the energy of an optical phonon. It is assumed that at  $T_0$  the optical phonons are not thermally excited and hence are not absorbed by electrons. It is further assumed that the increase in electron temperature due to the field does not exceed.  $\theta_0$  and that the electrons produce no optical phonons. Hence, the interaction between electrons and optical phonons is neglected. Card 2/6

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Effect of an electric field ...

Proceeding from these assumptions and using the expressions obtained in Ref. 1. as well as the quantities defined there, a number of relations is derived. E. g.,

$$s_1 \simeq 4\pi nkT \int \left(\frac{\partial \xi_0}{\partial t}\right)_L x^4 dx = \frac{4n^2e^4}{M_1} \left(\frac{2\pi m}{kT}\right)^{1/2} \left(1 - \frac{T_0}{T}\right) \ln\left(\frac{h}{b_0}\right), \tag{11}$$

is obtained for the energy transferred per unit volume per unit time (when the distributions of the electrons of temperature T and of the impurity ions of temperature T are Maxwellian).

impurity ions of temperature 
$$T_0$$
 are maxwellian,
$$\frac{\partial}{\partial z} = \frac{8 \text{ns}^2 \text{T}}{1 \text{T}_0} \left( \frac{2 \text{mkT}}{1 \text{C}} \right) \frac{1}{2} \cdot \left( 1 - \frac{T_0}{T} \right) \frac{1}{2} \cdot \left( 1 - \frac{T_0}{T} \right) \frac{1}{2} \cdot \left( \frac{1}{2} \cdot \frac{1}$$

are obtained for the energy transferred by electrons. Besides,

are obtained for the charge 
$$\alpha_1 = \frac{4ms^2}{kT_0} < 1$$
,  $\alpha_2 = 2s(\frac{3m}{kT_0} \frac{T}{T_0})^{\frac{1}{2}} < 1$  and (13), the conditions  $\alpha_2 = \frac{4ms^2}{kT_0} < 1$  and  $\alpha_3 = \frac{4ms^2}{kT_0} < 1$  and  $\alpha_4 = \frac{4ms^2}{kT_0} < 1$  and  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (13), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (14), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (15), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (15), the conditions  $\alpha_5 = \frac{4ms^2}{kT_0} < 1$  and (15), the cond

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## "APPROVED FOR RELEASE: 08/22/2000

#### CIA-RDP86-00513R000411730007-8

25679 S/181/61/003/007/001/023 B102/B202

Effect of an electric field ..

applicability of the method of the kinetic equation. ( $\lambda$  is the Debye electron wavelength, h the Debye radius, b<sub>0</sub> = e<sup>2</sup>/3kT); the latter condition is that for the application of the Landau method. Furthermore, according to Ref. 10, the quantity  $\gamma_{\rm E}$  characterizing the density of an ionized plasma,  $\gamma_{\rm E} = -\frac{\sqrt{|\Gamma|}}{6\gamma_{\rm E}}$   $\gamma_{\rm E}$ , is calculated and found to be  $\gamma_{\rm E} = 0.578$  which is

in good agreement with the value obtained in Ref. 10.

 $T = \frac{T_0}{2} \left[ 1 + \sqrt{1 + \frac{3\pi}{32} \frac{(e_0 F1)^2}{ms^2 kT_0}} \right]$  (30) is obtained for the electron temperature by

proceeding from  $\frac{T}{T_0} \left( \frac{T}{T_0} - 1 \right) = \sqrt{3} \sqrt{E} \frac{\left( \frac{e}{o} F1 \right)^2}{ms^2 kT_0} (28)$ . The conduction current  $4e_0^2 FkT = \sqrt{2kT} \sqrt{2} \sqrt{2} \log 1 = \frac{8e^2 Fnl_0}{2} \left( \frac{2}{o FnT_0} \right) \sqrt{2} \log 1$ 

density is obtained from  $j = \frac{4e_0^2 FkT}{\pi e^4 ln_b^2} \left(\frac{2kT}{\pi m}\right)^{1/2} \gamma_E(29) \text{ as } j = \frac{8e_0^2 FkT}{(kT_0)^{3/2}} \left(\frac{2}{\pi mT}\right)^{1/2} \gamma_3 \gamma_E(35)$ 

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where

$$\tau_8 = \frac{\sigma_1 \tau^8}{\ln \left(\sigma_2 \tau^{l/s}\right)}, \qquad (32)$$

$${}^{1}c_{1} = \frac{(kT_{0})^{3}}{2\pi nl_{0}\sigma^{4}}; c_{2} = 3\left(\frac{c_{1}l_{0}}{2\sigma^{2}}\right)^{l/2}.$$
 (33)

Hence it was found that in the region of impurity scattering the electron interaction considerably influences not only the symmetrical part of the distribution function but also the antisymmetrical part; the change of the latter has to be taken into account when deriving the formulas. The authors thank V. N. Ponomarenko for assistance. There are 6 figures and 10 references: 6 Soviet-bloc and 4 non-Soviet-bloc. The most important references to English-language publications read as follows: Ref. 10: L. Spitzer a. R. Härm. Phys. Rev. <u>89</u>, 977, 1953; Ref. 6: R. W. Keyes. J. Phys. Chem. Solids, <u>6</u>, 1, 1958; Ref. 4: S. H. Koenig. J. Phys. Chem. Solids, 8, 227, 1959.

ASSOCIATION:

Institut poluprovodnikov AN USSR Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

Card 5/6

BARBOY, V.M.; GLAZMAN, Yu.M.; DYKMAN, I.M.

Coagulation of lyophobic sols under the effect of electrolyte mixtures. Part 3: Effect of counter-ion adsorption [with summary in English]. Koll.zhur. 23 no.4:376-380 Jl-Ag '61. (MIRA 14:8)

1. Tekhnologicheskiy institut legkoy promyshlennosti, Kiyev.

(Adsorption) (Electrolytes)

BARBOY, V.M.; GLAZMAN, Yu.M.; DYKMAN, I.M.

Coagulating action of electrolyte mixtures on lyophobic sols. Effect of counterions. Dokl.AN SSSR 138 no.1:139-142 My-Je '61. (MIRA 14:4)

1. Kiyevskiy tekhnologicheskiy institut legkoy promyshlennosti. Predstavleno akademikom P.A.Rebinderom. (Colloids) (Electrolyte solutions) (Coagulation)

DYKMAN, I. M.; TOLPYGO, Ye. I.

Magneteresistance and Hall effect in semiconductors with hot electrons and in a plasma. Fiz. tver. tela 4 no.4:896-908 Ap 162. (MIRA 15:10)

1. Institut poluprovednikov AN UkrSSR, Kiyev.

(Semiconductors—Electric properties)

24.7700

37920 \$/181/62/004/005/002/055 B102/B104

AUTHORS:

Dykman, I. M., and Tomchuk, P. M.

TITLE:

The effect of an electric field on the electron temperature, the electrical conductivity, and the thermionic emission

from semiconductors. V

PERIODICAL:

Fizika tverdogo tela, v. 4, no. 5, 1962, 1082 - 1094

TEXT: The results obtained in earlier papers (FTT, 2, 2228, 1960; 3, 1909, 1961) are here generalized to the case where the concentration of conduction electrons differs from that of the impurity ions. First of all, the factor  $\beta$  is determined, which characterizes the deviation of the conductivity of a semiconductor under the action of an electric field F from the ohmic value;  $\sigma = \sigma_0 (1 + \beta F^2)$ , where  $\sigma_0$  denotes ohmic conductivity for  $F \rightarrow 0$ .  $\beta$  has been determined many times previously, but a certain generalization is made here. The effect of interaction among electrons is taken into account, but that of optical lattice vibrations is ignored. The effective carrier mass is assumed to be independent of

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The effect of an electric....

S/181/62/004/005/002/055 B102/B104

temperature. The equation

$$\beta = -\frac{e_0^2 l^2}{2ms^2 k T_0} \left\{ \gamma_3 \gamma_5 - 4\gamma_3 \left[ 1 - \frac{3}{4 \ln \left( \frac{h}{b_0} \right)} \right] \frac{d(\gamma_3 \gamma_5)}{d\gamma_3} \right\}_0.$$

with

$$\gamma_3 = \frac{(kT)^2}{2\pi n l e^4 \ln\left(\frac{h}{b_0}\right)}.$$

is obtained, which leads to the well-known formula  $\beta=\beta_a=-(3\pi/64)(\mu_a/s)^2$  for the case of pure lattice scattering (Gunn, Progress in Semiconductors, 2, 211, New York, 1957). An explicit formula for  $\beta$  is also given for the case of pure impurity scattering. The ratio  $\beta/\beta_a$  as a function of  $\gamma_3$  is investigated, for which purpose

Card 2/5

$$\gamma_3 = \frac{4e^2}{9lkT_0 \ln\left(\frac{h}{b_0}\right)} \left(\frac{h}{b_0}\right)^2,$$

### "APPROVED FOR RELEASE: 08/22/2000 CIA-RI

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S/181/62/004/005/002/055 B102/B104

The effect of an electric ....

is particularly suitable. If  $\gamma_3$ = 1 (conductivity amounts to 75% of the maximum),  $\beta = 0.33\beta_a$ ; for  $\gamma_3$ = 4,  $\beta \leq 0.6\beta_a$ . The role of

electron-electron interaction is investigated for various concentrations of electrons and impurity ions. This, for example, is the case with an n-type semiconductor which contains both donor and acceptor ions. Various relations are derived, including one between the electron temperature T and the current j:

 $\frac{T}{T_0} \left( \frac{T}{T_0} - 1 \right) = \frac{(e_0 F l)^2}{m_2 k T_0} \gamma_3 \gamma_E (\gamma_3, \gamma_4); \ j = \frac{16e_0^2 n l F}{(2\pi m k T)^{1/3}} \gamma_3 \gamma_E (\gamma_3, \gamma_4),$ 

In the following, the effect of interaction between electrons and optical lattice vibrations is investigated. The equations

$$\frac{T}{T_0} - 1 + b \frac{k\theta_0}{8ms^2} \cdot \frac{\sinh\left(\frac{\alpha_0 - a}{2}\right)}{\sinh\left(\frac{\alpha_0}{2}\right)} \alpha \alpha_0 K_1\left(\frac{a}{2}\right) = \frac{1}{12} \cdot \frac{(e_0 FI)^2}{ms^2 k T_0} \left(\frac{T_0}{T}\right)^{1/6} \cdot \frac{a}{a_0}.$$

and

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The effect of an electric....

S/181/62/004/005/002/055 B102/B104

$$\frac{\sigma}{\sigma_{a}} = \frac{9\pi}{32} \left( \frac{\pi T_{0}}{T} \right)^{1/t} \frac{\gamma_{3}}{Q_{0}} \left[ 1 + \frac{\left( Q_{1} - \frac{5}{2} Q_{0} \right)^{2}}{\left( \frac{\pi}{B} \right)^{1/t} Q_{0} + Q_{3} Q_{0} - Q_{1}^{2}} + \dots \right]$$

with

$$Q_n \equiv \int_0^\infty x^{3\tau+1} Q(x) e^{-s^2} dx = \frac{\sqrt{\pi}}{4} n! + \frac{\sqrt{\pi}}{2} \gamma_3 \times$$

$$\times \left\{ (n+2)! + (-1)^{n+1} a_0 a^{n+3} b N_0 e^{\frac{a_0}{3}} \frac{d^{n+1}}{da^{n+1}} \left[ \frac{\operatorname{ch} \left( \frac{a_0 - a}{2} \right)}{a} K_1 \left( \frac{a}{2} \right) \right] \right\}.$$

are obtained. These equations allow T to be obtained as a function of the applied field strength and of the parameters of the semiconductor.  $K_1(\alpha/2)$  is a Bessel function. The definitions of the other quantities are to be taken from the previous papers mentioned above. There are 2 figures.

Card 4/5

The effect of an electric....

S/181/62/004/005/002/055 B102/B104

ASSOCIATION:

Institut poluprovodnikov AN USSR (Institute of Semiconductors, AS UkrSSR). Institut fiziki AN USSR Kiyev (Institute of Physics AS UkrSSR, Kiyev)

SUBMITTED:

November 15, 1961

Card 5/5

DYKMAN, I.M.; ZINGERMAN, Ya.P.; ISHCHUK, V.A.; MOROZOVSKIY, V.A.

Nonequilibrium electron emission from a p - n-junction in silicon. Fiz. tver. tela 4 no.8:2015-2025 Ag '62. (MIRA 15:11)

1. Institut fiziki AN UkrSSR, Kiyev.
(Electrons-Emission) (Junction transistors)

5/181/62/004/012/028/052 B125/B102

AUTHORS:

Dykman, I. M., and Tomchuk. P. M.

TITLE:

The electrical conductivity of polar semiconductors with

allowance for electron-electron interaction

PERIODICAL: Fizika tverdogo tela, v. 4, no. 12, 1962, 3551-3563

TEXT: The temperature and concentration dependences of the electron mobility  $\mu = \sigma/e_0 n$  in polar semiconductors are calculated allowing for the scattering of electrons from longitudinal and optical vibrations, from impurity ions and from other electrons. To is the conductivity, eo is the charge and n is the electron concentration. A homogeneous polar crystal, whose conduction electron concentration is constant as to space and time and which incorporates impurity centers (near the bottom of the conduction band) having the concentration N, is assumed to be placed in a homogeneous electric field F. The dispersion law is assumed to be parabolic. In the 

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The electrical conductivity ...

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the first term denotes the change in the distribution function  $f_{-}(\vec{p}) = f_{0}(p) + \cos \vartheta f_{1}(p)(\cos \vartheta - p_{p}/p)$ 

of the conduction electrons under the influence of an electric field. The remaining terms denote the effect of electron interaction with the lattice, with the impurity ions and with themselves. After introducing dimensionless variables and functions

 $x^2 = \frac{p^2}{2mkT} \,, \tag{10}$ 

 $\xi_0(x) = \frac{1}{n} (2\pi mkT)^{1/2} f_0(x), \quad \xi_1(x) = \frac{1}{n} (2\pi mkT)^{1/2} f_1(x), \quad (11)$ 

the operator equation

 $\alpha L_1 \left[ \eta(x) \right] + L_2 \left[ \eta(x) \right] = \gamma_2 U(x)$ 

is derived from (1) following a method developed by the authors (e.g. FTT, 1909, 1961; FTT, 4, 1082, 1962) using

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# "APPROVED FOR RELEASE: 08/22/2000 CIA

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The electrical conductivity ...

S/181/62/004/012/028/052 B125/B102

$$\left(\frac{\partial f}{\partial t}\right)_{L} = \left(\frac{\partial f_{0}}{\partial t}\right)_{L} + \cos \theta \left(\frac{\partial f_{1}}{\partial t}\right)_{L},\tag{3},$$

$$\left(\frac{\partial f_{0}}{\partial t}\right)_{L} = -\frac{e_{0}F_{0}N_{0}}{p} \left\{ \left[f_{0}(\epsilon) - e^{\epsilon_{0}}f_{0}(\epsilon + k\theta_{0})\right] \Phi(\epsilon) + \right.$$

$$\left. + \left[e^{\epsilon_{0}}f_{0}(\epsilon) - f_{0}(\epsilon - k\theta_{0})\right] \Phi(\epsilon - k\theta_{0}) u(\epsilon - k\theta_{0}) \right\},$$

$$\left(\frac{\partial f_{1}}{\partial t}\right)_{L} = -\frac{e_{0}F_{0}N_{0}}{p} \left\{ f_{1}(\epsilon) \Phi(\epsilon) - e^{\epsilon_{0}}f_{1}(\epsilon + k\theta_{0}) \left[\frac{2\epsilon + k\theta_{0}}{2\sqrt{\epsilon}(\epsilon + k\theta_{0})} \Phi(\epsilon) - 1\right] + \right.$$

$$\left. + f_{1}(\epsilon) \Phi(\epsilon - k\theta_{0}) e^{\epsilon_{0}} u(\epsilon - k\theta_{0}) - f_{1}(\epsilon - k\theta_{0}) \times \right.$$

$$\left. \times \left[\frac{2\epsilon - k\theta_{0}}{2\sqrt{\epsilon}(\epsilon - k\theta_{0})} \Phi(\epsilon - k\theta_{0}) - 1\right] u(\epsilon - k\theta_{0}) \right\}.$$

$$\left. (5) \right.$$

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The electrical conductivity ...

S/181/62/004/012/028/052 B125/B102

as obtained by R. Stratton (Proc. Roy. Soc., 246A, 406, 1958), which holds where the electrons interact with optical vibrations only. The self-adjoint and positive definite operator  $L_1$  denotes the electron-electron scattering and the operator  $L_2$  the scattering from optical vibrations and from impurity ions. It is perhaps possible to solve (21) by iteration, but the calculation would be lengthy. For small field strengths and at  $T = T_0$  by a method of variations worked out by P. M. Tomchuk (FTT, 3, 1258, 1961). The equations

$$\sigma = \frac{\sqrt{\pi}}{3} \frac{mx^2}{e_0^2 \ln (\hbar/b_0)} \left(\frac{2kT_0}{\pi m}\right)^{s_1} \left\{ \frac{9\pi}{64 \int\limits_0^\infty Q\left[xe^{-x^2}\right] dx} + \frac{b_1^2}{L_{11}} + \sum_{n=2}^\infty \frac{(D_0^{(n-1)})^2}{D^{(n-1)}D^{(n)}} \right\}$$
(27),

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The electrical conductivity ...

.S/181/62/004/012/028/052 B125/B102

$$D^{(n)} = \begin{vmatrix} L_{11}, L_{12}, \dots L_{1n} \\ L_{21}, L_{22}, \dots L_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ L_{n1}, L_{n2}, \dots L_{nn} \end{vmatrix}, D_{b}^{(n-1)} = \begin{vmatrix} L_{11}, L_{12}, \dots L_{1, n-1}, b_{1} \\ L_{21}, L_{22}, \dots L_{2, n-1}, b_{2} \\ \vdots & \vdots & \ddots & \vdots \\ L_{n1}, L_{n2}, \dots L_{n, n-1}, b_{n} \end{vmatrix},$$

$$L_{mn} = L_{mn} = \alpha L_{mn}^{(1)} + L_{mn}^{(2)}, \qquad (29),$$

the matrix elements

$$L_{mn}^{(2)} = \int_{0}^{\infty} x^{2m-1} L_{2} \left[ x^{2n-1} \right] dx$$
 and

$$L_{mn}^{(2)} = \frac{1}{4mn} \left[ (m, n) - \frac{\{m, 0\} \{0, n\}}{\{0, 0\}} \right]. \tag{36}$$

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The electrical conductivity ...

S/181/62/004/012/028/052 B125/B102

lead to

$$\mu = \frac{3\sqrt{\pi}}{8} \frac{1}{N_0 F_0} \left(\frac{2kT_0}{m}\right)^{1/2} \frac{\gamma}{(0,0)} \left[1 + \frac{b_1^2}{L_{11}} + \frac{(\tilde{L}_{11}\tilde{b}_2 - L_{12}\tilde{b}_1)^2}{L_{11}(L_{11}L_{22} - L_{12}^2)} + \cdots\right]. \tag{40}$$

which describes the mobility, and for sufficiently low temperatures to

$$\frac{\mu}{(i_0)_{T_0>0_0}} = \frac{9\pi}{32} \frac{\gamma}{(0,0)} \left[ 1 + \frac{b_1^2}{L_{11}} + \frac{(L_{11}b_2 - L_{12}\tilde{b}_1)^2}{L_{11}(L_{11}L_{22} - L_{12}^2)} + \dots \right], \tag{43},$$

$$\frac{\frac{\mu}{(\mu_0)_{T_0<\theta_0}} = \frac{3}{4} \left(\frac{\pi}{\varepsilon_0}\right)^{1/2} \frac{\gamma}{(0,0)} \left[1 + \frac{b_1^2}{L_{11}} + \frac{(L_{11}b_2 - L_{12}b_1)^2}{L_{11}(L_{11}L_{22} - L_{12}^2)} + \dots\right]. \tag{44}$$

The effect of the Coulomb scattering mechanism increases with decreasing T  $_{\rm o}$ . Card 6/8

The electrical conductivity ...

8/181/62/004/012/028/052 B125/B102

increasing concentration, the relative mobility  $\mu/(\mu_0)_{T_0} \geqslant \theta_0$  increases at first more strongly and then more weakly. The smaller  $z_0 = \theta_0/T_0$ , the larger is the value of the relative mobility.

ASSOCIATION: Institut poluprovodnikov AN USSR (Institute of Semiconductors AS UkrssR); Institut fiziki AN USSR, Kiyev (Physics Institute AS UkrssR, Kiyev)

SUBMITTED: July 9, 1962

Fig. 1. The dependence of the relative mobility on  $z_0$ . Solid curve for a constant value of the parameter  $\gamma$ : (1)  $\gamma$  = 10, (2)  $\gamma$  = 5, (3)  $\gamma$  = 2, (4)  $\gamma$  = 1, (5)  $\gamma$  = 0.5. Dot-dashed curve  $\gamma \rightarrow \infty$ . Dashed curves at concentration: (6)  $n = n_1$ , (7)  $n \simeq n_1/40$ , (8)  $n \simeq n_1/80$ ,

Card 7/8

$$\mu_{I} = \frac{2m\pi^{2}}{ne_{0}^{3} \ln \left(h/b_{0}\right)} \left(\frac{2kT_{0}}{\pi m}\right)^{b_{1}}; \qquad \qquad \gamma = \frac{\mu_{I}}{3 \left(\mu_{0}\right)_{T_{a} > \theta_{a}}}$$

ACCESSION NR: AP4034918

S/0181/64/006/005/1388/1398

AUTHORS: Dyskman, I. M.; Tomchuk, P. M.

TITLE: The effect of majority carriers in semiconductors on the mobility of

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1388-1398

TOPIC TAGS: semiconductor, majority carrier, minority carrier, drift velocity,

ABSTRACT: The authors examined semiconductors with various carriers at very different concentrations, and they solved the kinetic equations for minority carriers. Under certain conditions it is found that the distribution of minority carriers is approximately Maxwellian, with the temperature of majority carriers. The mobility of the minority carriers has also been computed. When there is no substantial lattice scattering, the minority mobility is determined by the Coulomb only on the ratio of effective carrier masses. The effect of entrapment is determined by this function. When the charges on the carriers are of opposite sign, the cord 1/2

ACCESSION NR: AP4034918

is greater than the mass of the majority carriers. When the masses of minority carriers differ significantly from each other, the situation is the same as when some charges are positive, some negative. The drift velocity will be determined by the average mobility. Orig. art. has: 3 figures and 43 formulas.

ASSOCIATION: Institut poluprovodnikov, AN USSR (Institute of Semiconductors, AN UkrSSR); Institut fiziki, AN UkrSSR, Kiev (Institute of Physics, AN UkrSSR)

SUBMITTED: 18Nov63

SUB CODE: EC

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OTHER: 005

Card 2/2

L 51823-65

ACCESSION NR: AP5017107

UR/0239/64/050/012/1415/1423

AUTHOR: Dykman, L. M.

TITLE: Electrophysiological characteristics of the reactions of the limbic

system to afferent stimuli

SOURCE: Fiziologicheskiy zhurnal SSSR, v. 50, no. 12, 1964, 1415-1423

TOPIC TAGS: brain, electroencephalography, experiment animal, neurology

ABSTRACT: A simultaneous study was made of the chronic conditions of activity of certain areas of the cortex, and limbic reticular systems, on the one hand, and certain specific subcortical formations on the other. The purpose was to compare the total background activity of the various parts of the cortex and subcortex, to discover any possible connections between a number of formations, and to study their reactions to afferent stimuli. The experiments were conducted on 30 rabbits; electrodes were placed according to the stereotactic coordinates proposed by Sawyer et al. (1954) as corrected by Moshcharskiy and Chernyshevskiy (1959). Visceral, tactile, pein, visual, and aural stimuli were used. The work included 85 experiments, in each of which the various afferent stimuli were repeated 8-10 times in random sequence. Recordings were made on a 15-channel electroencephalograph. Formations of Card 1/2

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ACCESSION NR: AP5017107

the limbic system displayed simultaneity and similarity in their reactions to afferent stimuli. Electrographic data indicate the closest connection between visceral and pain sensitivity and the structures of the limbic system. The greatest electrographic changes in response to visceral stimuli were observed in the anterior limbic region of the cortex, the tonsillar complex and the hypothalamus. In their electrographic responses to afferent stimuli, the limbic regions of the cortex are closer to the subcortical structures than to the sensorimotor cortex.

Orig. art. has: 4 figures.

ASSOCIATION: Laboratoriya elektrofiziologii Instituta psikhiatrii Ministerstva zdravookhraneniya RSFSR, Moscow (Laboratory of Electrophysiology of the Institute of Psychiatry, Ministry of Health RSFSR)

SUBMITTED: 18Aug62

ENCL: 00

SUB CODE: LS

OTHER: 010

JPRS

L 24797-65 EWT(m)/EWP(b)/EWP(t) IJP(c) JD S/0181/65/007/001/0286/0289

AUTHORS: Dykman, I. M.; Tomchuk, P. M.

TITLE: Anisotropy of conductivity of hot electrons and interelectron interactions

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 286-289

TOPIC TAGS: anisotropy, semiconductor, electric conductivity, electron interaction, germanium, electron phonon interaction

ABSTRACT: Using a calculation procedure employed in an earlier paper by the authors (FTT, v. 2, 2228, 1960), the authors determined the influence of the interelectron interaction on the change of the electron temperature in each valley of a multivalley semiconductor, and calculate the electron temperatures of each valley in germanium at a lattice temperature of 77K and a total electron concentration  $4 \times 10^{15}$  cm<sup>-3</sup>. The heating field was assumed applied along the [11]

Cord 1/3

L 24797-65
ACCESSION NR: AP5003454

direction, where maximum energy transfer to the cold valley was to be expected. The influences of acoustic and optical phonons on the apherically symmetrical part of the distribution function and of the acoustic phonons of the asymmetrical part were taken into account. The results show that although the temperature of the electron in the cold valley, the rotation axis of which coincides with the [111] direction, is much lower than that in the hot valleys, it is still raised noticeably by the interelectron interaction, as can be seen by comparison with the curve for the electron temperature without account of the interelectron energy transfer. It is also shown that the Coulomb energy transfer exerts a slight influence on the electric conductivity of the semiconductor. It is also shown briefly that the Coulomb effect can be evaluated by applying an additional weak that is one angle to the heating field, and varying the angle. Orig. art. has: I figure and 5 formulas.

ASSOCIATIO 1: Institut poluprovodníkov AN UkrSSR (Institute of

Card 2,/3

L 24797-65
ACCESSION NR: AP5003454

Semiconductors AN UkrSSR): Institut fiziki AN UkrSSR, Kiev (Institute of Physics AN UkrSSR)

SUBMITTED: 30Jul64 ENCL: 00 SUB CODE: SS

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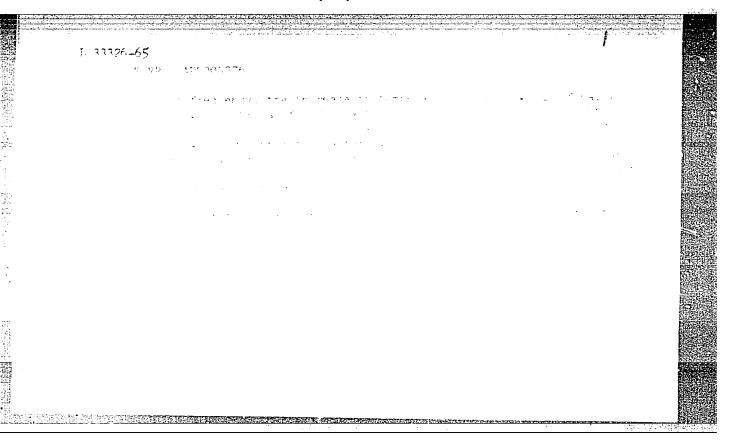
Microwave conductivity of semiconductors with carriers heated by a steady

The reverse conductivity, carrier terms of field,

The reverse conductivity, carrier terms of field,

The reverse conductivity of semiconductors with carriers heated by a steady

APPROVED FOR RELEASE: 08/22/2000 CIA-RDP86-00513R000411730007-8"



L 62673-65 EWT(1)/T/EWA(h) - LIP(c) AT ACCESSION NR: AP5017334

UR/0181/65/007/007/2237/2239

AUTHOF: Dykman, I. M.; Tolpygo, Ye. I.

Z.

TITLE: Anisotropy of microwave conductivity and absorption in semiconductors with hot carriers

SCURCE: Fizika tverdogo tela, v. 7, no. 7, 1965, 2237-2239

TOPIC TAGS: microwave conductivity, microwave absorption, anisotropy, semiconductor, carrier temperature, carrier density, but convier, option, sensity

ABSTFACT: This is a continuation of earlier work by the authors (FTT v. 7, 414, 1965) is along with some singularities of the microwave conductivity in semiconductivity in semiconductivity. The present paper is devoted to the microwave conductivity and absorption in or seed fields, in which the weak microwave field is perpendicular to the constant field. Most of the results of the earlier paper are applicable. The constant field. Most of the results of the earlier paper are applicable. The constant field and the coefficient of absorption of the electromagnetic waves were calculated numerically for a semiconductor with the same parameters as germanium, a partier density 1016 cm<sup>-3</sup>, and a lattice temperature TTK. The calculation shows that the general character of the dependence of the conductivity on the field strength remains the same as before, apart from a phase shift. At low frequencies,

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ACCESSION NR: AP5017334

however, the perpendicular component of the conductivity is much closer to the dc conductivity than the parallel component. The anisotropy of the microwave conductivity is shown not to exceed 10% Likewise, the greatest difference between

tire perpendicular and parallel components of the wave absorption coefficient takes with an inverse and large fields, but the anisotropy reaches 20—30%, causing appropriate applical activity. Originant, has all figures and 2 formulas.

ASSOCIATION: Institut poluprovodnikov AN UkrSSR, Kiev (Institute of Semiconduc-

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ENCL: 00

SUB CODE: EC, SS

OTHER: 001

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L 6L119-65 EMT(1)/EWT(m)/T/EMP(t)/EMP(b)/EMA(h) IJP(c) JD/AT ACCESSION NR: AP5019840 UR/0181/65/007/008/2298/2308 AUTHOR: Dykman, I. M.; Tomchuk, P. M. TITIE: Anisotropic effect of interelectronic scattering on the conductivity semiconductors with ellipsoidal isoenergetic surface SOURCE: Fizika tverdogo tela, v. 7, no. 8, 1965, 2298-2308 TOPIC TAGS: scattering, interelectronic scattering, impurity scattering, semiconfunt residentical conductivity, lattice temperature, germanium many valley semicondistrict a mitter - variational principle is formulated for the allitic of the kinetic and if a low is convenient for taking into account impority and interelectronic and one mechanisms in semiconductors with an ellipseital istemergetic carrier the principle is utilized in finding the expresentate electron distriof a much in calculating the components of the components for or with a constant energy surface in the firm for collipseid of in is shown that when the lattice temperature is softlineably small and sectoring mechanisms are not important, the interelectronic scattering The is the conductivity, especially the conductivity in the direction of the motion of the heavy mass. In Ge, if a proper deformation transfers the conduc-

L 64119-65

ACCESSION NR: AP5019840

tion electrons into a valley, the conductivity in the direction of the axis of rotation of the ellipsoid decreases to almost one-third of its original value. As a result, the anisotropy angle 0 in Ge, which is a function only of the angle between the field and the axis of rotation and M<sub>14</sub>/M<sub>1</sub>, is 2—3 times larger than 0 calculated with a taking into account interelectronic scattering. In compensated semiconductors a shall become se with an increasing concentration of acceptors. Orig. art. has:

ASSOCIATION: Institut poluprovodníkov AN UkrSSR (Institute of Semiconductors, AN Ext. 1981 tot Siziki AN UkrSSR, Kiev (Physics Institute AN UkrSSR)

EN IL: 01

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OTHER: 006

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// - TANE / TO LUE ( C) / ENP( D) / ENA( h) IJP(c) JD/AT ACC NR AP5027419 SOURCE CODE: UR/0181/65/007/011/3378/3385 AUTHOR: Grigor'yev, N. N.; Dykman. ORG: Institute of Semiconductors, AN UkrSSR, Kiev (Institut poluprovodnikov AN UkrSSR TITLE: Temperature and mobility of hot electrons in polar semiconductors 11115 SOURCE: Fizika tverdogo tela, v. 7, no. 11, 1965, 3378-3385 21,44,55 TOPIC TAGS: semiconductor alloy, indium alloy, electron gas, electron mobility, Coulomb scattering, impurity scattering 55 v ABSTRACT: The function of electron distribution in alloyed polar semiconductors in electric fields of arbitrary strength has been determined with the aid of a kinetic equation. The interaction between the electrons, between the electron and the optical lattice oscillations, and between the electron and impurity ions were taken into account. The dependence of the mobility  $\mu$  and the electron temperature T in n-InSb on the applied field shows that T and  $\mu$  change slightly with the field only in the region of very weak fields. With the growth of the applied field, the electron temperature T increases, and dT/dF increases up to some limiting field F\* at which dT/dF  $\rightarrow \infty$ . Beginning with some electron concentrations n the value of F\* rapidly increases with the rise of n. The competing Coulomb and lattice scattering mechanisms determine the dependence of  $\mu$  on F. At small n, the mobility noticeably decreases with the field. At sufficiently large n in weak fields, it may even increase. The dependence of mobility Card 1/2

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on the	field F, dependence	lattice t e of μ on	emperatur n takes	re T <sub>O</sub> , a place i	nd the con weak f	oncentra ields at	tion n	shows th	at the is region		
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SOURCE CODE: UR/0048/66/030/012/1927/1929

AUTHOR: Grigor yev, N. N.; Dykman, I.M.; Tomchuk, P. M.

ORG: none

TITLE: Emission of hot electrongifrom a polar semiconductor having a nonparabolic dispersion law /Report Twelfth All-Union Conference on the Physical Fundamentals of Cathode Electronics held at Leningrad, 22 - 26 Oct. 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizichoskaya, v. 30, no. 12, 1966, 1927-1929

TOPIC TAGS: thermionic emission, electron emission, electric field, semiconducting material, indium compound, antimonide, mathematic physics

ABSTRACT: The authors discuss thermo-electron emission from a polar semiconductor in which the carriers have been heated by an applied electric field. An approximate expression for the electron emergy distribution in such a semiconductor is written but not derived. This expression is valid for an arbitrary dispersion law relating the electron energy E and momentum p, and in addition to its dependence on the dispersion law it depends on the lattice temperature, the optical phonon temperature, and the ratio F/Fo of the electric field strength F to a certain field strength Fo that was introduced by H.Frolich and B.V.Paranjape (Proc. Phys.Soc. B69, 21 (1956)) and has a value of some 300 or 400 V/cm for Insb. This distribution function was employed to calculate the thermo-electron emission current for the case when the dis-

Card 1/2

ACC NR: AP 7001722

persion law is  $p^2/2m = E(E + E/G)$ , where m is the effective mass of the electron at the bottom of the band and G is the energy width of the forbidden gap. This dispersion law is believed to be valid for InSb. It is found that when the work function is greater than thee forbidden gap width, the nonparabolicity of the dispersion law results in an appreciable increase of the Richardson current. The application of an electric field greatly increases the thermo-electron emission current over the Richardson value. This is illustrated by a curve showing the thermo-electron emission current as a function of the applied electric field, the curve being calculated with parameter values appropriate to InSb with a reduced work function of 1.1 eV. An electric field of strength Fo increases the emission by several orders of magnitude over the no field (Richardson) value, and with fields that might be achieved by pulsing, the emission could be enhanced by as much as 10 orders of magnitude. Orig. art. has: 5 formulas and 1 figure.

SUB CODE: 20 SUBM DATE: None ORIG. REF: 005 OTH REF: 001

Card 2/2

- 1. DYKMAN, KH.
- 2. USSR (600)
- 4/ Building Trades Study and Teaching
- 7. In the village of Velikoye. Sel'. stroi. 2 no. 4. 1947.

9. Monthly List of aussian Accessions, Library of Congress, March 1953. Unclassified.

POLONSKIY, I.: DYKMAN, KH.
 USSR (600)
 Bryansk Province - Reconstruction (1939 - )
 Urgent tasks of builders of the Bryansk area. Sel'. Stroi. 2. no. 6. 1947.

DY ~ MAIN, ~11.

9. Monthly List of Russian Accessions, Library of Congress, March 1953. Unclassified.

LY KIVININ, NA.

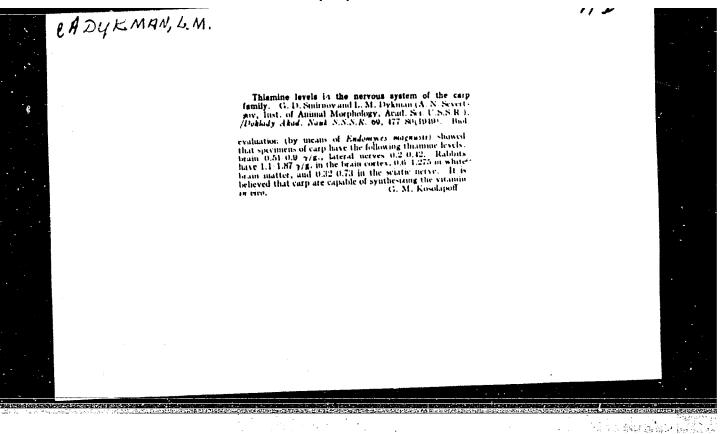
- 1. T DYKMAN, KH.
- 2. USSR (600)
- 4. Lumbering
- 7. Progressive collective of builders. Sel'. stroi. 2 no. 7 1947.

9. Monthly List of Russian Accessions, Library of Congress, March 1953. Unclassified.

NY MINININ, WIT.

- 1. DYKMAN, Kb.
- 2. USSR (600)
- 4. Dmitriev, Vasilii Dmitrievich
- 7. Carpenter brigade leader V. D. Dmitriyev, Sel'. stroi., 2, Mo. 3, 1947.

9. Monthly List of Russian Accessions, Library of Congress, March, 1953. Unclassified.



USSR/Medicine - Transplantation of Organs

258T22

Jul 53

"Transplantation of Organs and the Problem of Compatibility of Tissues," G. V. Lopashov, OL. M. Dykman

Priroda, Vol 41, No 7, pp 33-39

Homotransplantations can be readily accomplished in tailed amphibia, but not adult tailless amphibia. However, the heart of an adult frog can be grafted onto another frog. In the case of mammals, only tissues which have a low metabolism (cornea, cartilage, teeth) or organs which carry a heavy functional load (kidneys) can be successfully homotransplanted. The immunological reactions to tissues from another individual can be lowered by selecting a younger donor and host, by acting on the nervous system through the medium of artificially induced sleep, or by affecting the immunogenic system with the aid of acetylcholine and cortisone. Expts show that immuno- 258T22 logical reactions to foreign tissue are not local, but general, i.e., involve participation of the whole organism contg an intact hemopoietic system (spinal cord, spleen, liver).

TOLMASSKAYA, E.S.; DYKMAN, L.M.

Role of the reticular formation in conducting interceptive impulses. Zhur.vys.nerv.deiat. 12 no.1:161-168 Ja-F '62.

(MIRA 15:12)

1. Electrophysiology Laboratory, Institute of Psychiatrics, R.S.F.S.R. Ministry of Health, Moscow.
(ELECTROENCEPHALOGRAPHY) (REFLEXES)

. DYKMAN, L.M.

Electrophysiological characteristics of reactions of the limbic system to afferent stimuli. Fixiol. zhur. 50 nc.12:1415-1423 D 164. (MTRA 18:9)

1. Laboratoriya elektrofiziologii Instituta psikhiatrii Ministerstva zadravookhraneniya RSFSR, Moskva.

KLYUCHIKOV, V.N.; DYRMAN, L.M.

Clinicophysiological characteristics of chronic hyperkinetic forms of tick-borne encephalitis. (Kozhevnikov's epilepsy syndroms). Zhur. nevr. i psikh. 64 no.3:351-359 164.

(MIRA 17:5)

1. Nauchno-issledovatel'skiy institut psikhiatrii (direktor - prof. D.D. Fedotov), Moskva; kafedra nervnykh bolezney
Yaroslavskogo meditsinskogo instituta.

TOLMASSKAYA, E.S.; DYKMAN, L.M. [decedsed]; ARSHAVSKIY, V.V.

Mechanism of the action of reserpine. Trudy Gos. nauch.-issl. inst. psikh. 42:129-138. \*65.

1. Otdeleniye patofiziologii vysshey nervnoy deyatel'nosti (zav.- prof. E.S. Tolmasskaya) i laboratoriya elektrofiziologii Gosudarstvennogo nauchno-issledovatel'skogo instituta psikhiatrii Ministerstva zdravookhraneniya RSFSR.

CORSON, Samuel A.; O'LEARY CORSON, Elizabeth; DYKMAN, R.A.; PETERS, J.E.; REESE, W.G.; SEAGER, L.D.

The nature of conditioned antidiuretic and electrolyte retention responses. Activ. nerv. sup. 4 no.3/4:359-382 '62.

1. Psychiatric Inst., Ohio State Univ. Health. Center, Columbus, Ohio and Yale Univ. School of Medicine, University of Arkansas Medical Center.

(REFLEX CONDITIONED) (DIURESIS) (REFLEX)
(WATER ELECTROLYTE BALANCE)

ACC NR. AT6023553 (N) SOURCE CODE: UR/3095/66/036/000/0015/0025

AUTHOR: Kolesnikov, A. G.; Panteleyev, N. A.; Aretinskiy, G. Yu.; Dykman, V. Z.

ORG: None

TITLE: Apparatus for measuring the turbulent pulsations of current speed and temperature at great ocean depths

SOURCE: AN UkrSSR. Morskoy gidrofizicheskiy institut. Trudy, v. 36, 1966. Metody i pribory dlya issledovaniya fizicheskikh protsessov v okeane (Methods and instruments for studying physical processes in the ocean), 15-25

TOPIC TAGS: <u>occanographic oquipment</u>, occanographic expedition, oceanographic instrument, occanographic obique, oceanography, ocean current, temperature detector, temperature measurement, electronic equipment, transistorized circuit, TURBIDIMETER, OCEAN PROPERTY GAT-3 TURBIDIMETER

ABSTRACT: The third model of a deepwater automatic turbulence meter (GAT-3), a transistorized version of the earlier GAT-2, developed in 1964, is described. Work on these meters began in 1956 in the Maritime Hydrophysical Institute of the Academy of Sciences of the Ukranian SSR under the leadership of Member-Correspondent A. G. Kolesnikov. The GAT-3 permits simultaneous recording on seven channels, of the vertical and horizontal components of speed pulsation, average speed, three components of the instrument's self-acceleration, and time. Temperature pulsations are also registered by a preheated sensitive element. The meter is encased in a steel

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ACC NR: AT6023553

container, designed for a maximum depth of 12 kilometers and was first used in the Atlantic Ocean in 1962, during the twelfth cruise of the scientific research ship Mikhail Lomonosov. A block diagram of the major measurement channels in the meter is included and described in brief. A more detailed wiring diagram and description of the major components, including the oscillator, measuring bridge, imbalance amplifier, phase discriminator and automatic balancing block is included. The calibration scale, recording device, automatic control system, and their mountings are described in brief. The shortcomings of this meter and an indication of the direction in which new work on improved measuring devices and methods is headed, with special importance attached to maximum diminution of size and weight of both meter and container for use directly on the ocean floor, concludes the article. Orig. art. has: 5 figures.

SUB CODE: 08,20/SUBM DATE: None/ORIG REF: CO2

Card '2/2

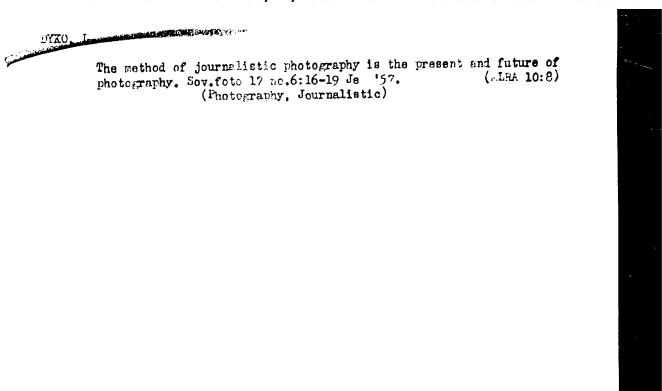
KHOLDIN, S.A.; DYKMAN, Z.I.

Evaluation of prognostic factors in cancer of the breast. Vop. onk. 11 no.3:3-8 165. (MIRA 18:6)

l. Iz 1-go khirurgicheskogo otdeleniya (zav. - chlen-korrespondent AMN SSSR prof. S.A. Kholdin) Instituta enkologii AMN SSSR (čir. - deystvitelinyy chlen AMN SSSR prof. A.I. Serebrov).

DYKMAN, YE.

Preparing the bed of the Tsymlyansk reservior, Sel. stroi. 7, No 2, 1952.



DYKO, Lidiya Pavlovna, dotsent; IOFIS, Yevsey Abramovich, dotsent; ZHERDETSKAYA, N.N., red.; MALEK, Z.N., tekhn.red.

[Photography, technology and art] Fotografiia, ee tekhnika i iskusstvo. Moskva, Gos.izd-vo "Iskusstvo," 1960. 494 p. (MIRA 13:7) 1. Vsesoyuznyy gosudarstvennyy institut kinematografii (for Dyko, Iofis).

(Photography)

FEDOROVA, N.I.; ZOLOTOR'YAN, T.G.; BRONSHTEYN, N.I.; DYKMAN, L.P.; VUNZEL', G.G.; YABLONSKAYA, Z.I.

Outbreak of Q fever among students of the Moscow Technological Institute of Meat and Dairy Industry. Zhur. mikrobiol., epid. i immun. 33 no.1:114-118 Ja 162. (MIRA 15:3)

1. Iz Instituta epidemiologii i mikrobiologii imeni Gamalei AMN SSSR, Moskovskoy gorodskoy sanitarno-epidemiologicheskoy stantsii i Vsesoyuznogo instituta myasnoy promyshlennosti.

(Q FEVER)

DYKU, Lidia, kand.iskusstvovedeniya

Content and form of news photography. Sov.foto 20 no.9:9-12 S '60. (MIRA 13:9) (Photography, Journalistic)